Irradiated Materials Laboratory

The Irradiated Materials Laboratory (IML) is equipped for handling, testing, and analyzing irradiated materials. The facility was designed and built to conduct postirradiation examinations of structural components for reactor development, and that role has expanded over the years to include testing of components. The research has helped to increase our knowledge of the behavior and properties of irradiated materials for commercial power reactors and research reactors. The facility has also provided information for the development and testing of advanced alloy materials for the Department of Energy fusion program. Testing capabilities include tensile and creep-rupture under vacuum or inert atmosphere up to 800°C, slow-strain-rate tensile testing (SSRT) up to 320°C in a controlled water environment, fracture toughness testing up to 320°C in a controlled water environment, and instrumented Charpy-impact testing (drop-weight system) to -190°C. Sample preparation capabilities include a remotely operated electric discharge machine (EDM) for cutting precise specimens from irradiated materials.

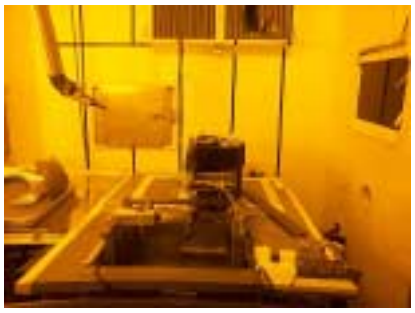
The IML consists of four air-atmosphere, centicurie beta/gamma hot cells. The interior of each cell is 6 ft wide x 5 ft deep x 9 ft 8 in. high and is maintained at a negative air pressure. Each cell is equipped with movable doors that allow the cell equipment to be easily installed, removed, and reconfigured to support the mission of the cell.

Hot Cell Configuration

- One cell contains a 0.5-ton hoist for removal of vertical cask lids.
- The side wall of each cell contains multiple 4-in.-diameter and two 12-in.-diameter access ports. Multiple internal ports connect the four cells.
- Viewing windows are located at the front (30 x 50 in.) and side (12 x 18 in.) of each cell.
- Two laboratory hoods are available for sample preparation.

Testing Equipment

- Instron 8511 servo-hydraulic-driven tension/compression/cyclic testing machine.



Remotely operated EDM in IML cell

Instron Model 8511material testing system

- Instron Model TT screw-driven tension testing machine.
- Instron 1122 screw-driven tension testing machine with integral radiant furnace capable of test temperatures up to ≈1100°C.
- Custom-built fracture toughness tester.
- Custom-built SSRT apparatus.
- Dynatup impact tester.

In-cell fracture toughness tester

Ancillary Equipment

- Charmille Andrew EDM for remote machining of precise test specimens from irradiated materials. Precision is ±0.0005 in.
- Macrocameras for magnifications from 1X to 20X.
- Laser profilometer, contact micrometers, and dial-gauge micrometers.
- Jet polishing apparatus for preparation of TEM specimens.
- High-temperature furnaces (radiant and resistance), computer-controlled for controlled heating cycles up to 1,400°C.
- Vacuum heat treatment furnaces.

Support Facilities

- Support gloveboxes, including shielded gloveboxes for preparing metallographic specimens and gold coater for preparing nonconductive specimens for electron beam analysis.
- "Hot Shop" support for machining low-level contaminated or activated mechanical test specimens.
- Electron Microscopy Center, with its 1.2-MeV electron microscope and high-resolution analytical microscope.
- Advanced Materials Fabrication Facility, which provides alloy preparation and casting, secondary fabrication, assembly and welding, and inspection services.
- Electron Beam Laboratory; which provides a scanning electron microscope, shielded electron microprobe, and scanning Auger electron microprobe to examine radioactive specimens.

Contact: Ms. Terri S. Bray
Manager
Irradiation Performance Section
Energy Technology Division
Argonne National Laboratory
9700 S. Cass Ave.
Argonne, IL 60439-4838
630-252-9957; Fax: 630-252-9232
email: tbray@anl.gov

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